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HISTORY OF THE QUEENSLAND HERBARIUM AND BOTANICAL LIBRARY. 1855 to 1976.*

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> At present advanced state to which our knowledge of the botany of Australia has attained, one is apt to forget the many excellent men who, at no small privations and often personal risk, first collected in these countries, and thus laid the very foundation upon which we at present build.

Those words are as relevant today as they were on 25 July 1891 when F. M. Bailey used them to introduce his Presidential Address to the Royal Society of Queensland (Bailey 1891).

Unless we are mindful of the contributions of our predecessors there is risk of losing the sense of continuity so necessary for the growth and development of knowledge and of progress in science, be it plant taxonomy or any other discipline. The main emphasis in this paper, therefore, will be on people and their influence, direct or indirect, on the development of the herbarium.

NATURE AND FUNCTIONS OF HERBARIA

An herbarium is an assemblage of labelled, dried plant specimens. It is used for research into the classification, relationships and distribution of plants and some of their properties, for teaching, and for documenting changes in the flora of a region with time (*see* Everist 1979). It differs from a catalogue, card index or computer record in that it comprises actual pieces of biological material. Each of these is taken from a unique point in space and time and none of them can be duplicated exactly after the original collection has been made. Sight records, on the other hand, may not be facts but simply fossilised opinions of the observers concerned.

All the systematic descriptive accounts of the flora of different regions of the world have been prepared on the basis of study of dried herbarium material. Occasionally, they have been supplemented by study of living plants also.

THE QUEENSLAND HERBARIUM

The Queensland Herbarium comprises an unknown number of such specimens (probably about 400 000) and this collection has been accumulated over a period of about 120 years. It is not easy to deal briefly with the history of an institution that has been in existence for such a long time. The history of the Queensland Herbarium is intimately linked with the social and political history of Australia, with the personalities of people engaged in botany and other scientific pursuits and with changes in needs, pressures and social structures within the community.

The subject will be considered under four main headings:

- History of exploration and land settlement in Australia

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† Died 21 October 1981.
* Slightly modified from an address delivered to the Queensland Naturalists Club, 18 October 1976.

- Changing needs and demands for botanical knowledge and services with changes in social and economic patterns
- People who directed the Herbarium and who contributed to knowledge of the plants of Queensland
- Buildings and other facilities available for the acquisition, storage and maintenance of specimens and books as working tools for contemporary botanists and as an expanding storehouse of data for use by succeeding generations.

EXPLORATION AND LAND SETTLEMENT

Seventeenth Century.

The earliest records we have of European contact with Australia are from the 17th century (for summary, *see* Flinders 1814). These were confined to the northern, western and southern coastlines and there are no records of any European sightings or landings on the east coast during the 17th century.

So far as can be determined, none of the 17th century captains except William Dampier (1688, 1699) brought back any natural history specimens from the new land. Dampier's collections and the accounts of all the 17th century navigators who landed on the northern and western coasts had no real influence on the botany of Australia. Their reports also did nothing to stimulate interest in the new land. The Dutch were primarily interested in trade and the depressing reports of poor land and miserable people, confirmed by Dampier, caused the Dutch East India Company to lose interest in this part of the world.

Eighteenth Century

The first major contribution to the botany of Australia was made by the *Endeavour* expedition under James Cook in 1770. This sailed along the whole east coast of the continent, landing at 10 different places (*see* Hawkesworth 1773; Beaglehole 1955). It was singularly fortunate for us that this expedition included Joseph Banks and Daniel Solander, outstanding naturalists of their day, and Sydney Parkinson, a young artist-illustrator of exceptional skill.

The sole task of these men was to study natural history and to collect, observe and illustrate plants and animals from the places visited by the expedition. According to Bailey (1891), this expedition added 1 000 species of plants to the 300 species previously known from the continent. A complete set of specimens was retained in the British Museum of Natural History and various duplicate specimens have been widely distributed to herbaria in Europe, North America, New Zealand and Australia (*see* Lanjouw & Stafleu 1954; Stearn 1968; McGillivray 1970).

Unfortunately, neither Banks nor Solander completed the task of describing and classifying the plants they collected. It was not until more than a century later that a comprehensive account of these collections was published (Banks & Solander 1900–1905). With these were printed lithographs prepared from some of Parkinson's drawings. Superb engraved copper plates of these drawings are still in the British Museum but remain unpublished, except for plates that were reconditioned and issued in 1970 to commemorate the Cook bicentenary.

Fortunately, 100 years earlier the specimens and manuscript descriptions had been made available to Robert Brown for study (1801 to 1810) and later

also to George Bentham when he was preparing *Flora Australiensis* between 1862 and 1878.

From the Queensland point of view, it is worthy of note that all Cook's landing places except Botany Bay were at sites now included in this State. We have only a few of the Banks and Solander specimens in the Queensland Herbarium but there are many more in the National Herbaria in Sydney and Melbourne.

The 18th century also saw the beginning of European settlement in Australia. A penal settlement was established at Sydney Cove on Port Jackson by Captain Arthur Phillip in January 1788. Several people, notably John White, Surgeon General, interested in the native flora, collected plant specimens and sent them to England for identification. In 1791 and 1792, Captain Vancouver made the first exploration of the southern coast since that of Pieter Nuyts in 1627. He sailed eastward from Cape Chatham in Western Australia to about the middle of the Great Australian Bight. He spent two days at King George Sound (site of the present town of Albany) where Archibald Menzies made large collections of plants. Whilst the settlement at Sydney was struggling for survival, local collectors such as William Paterson, George Caley and others were forwarding plant specimens and seeds from New South Wales and Tasmania to Sir Joseph Banks in London. Many of these plants were cultivated at Kew and elsewhere in Europe. Matthew Flinders and George Bass made sea voyages around Tasmania. Flinders visited Moreton Bay and climbed Beerburrum, one of Glasshouses north of where Brisbane is today.

It is important not to overlook the work of French naturalists about this time. Labillardiere who accompanied D'Entrecasteaux in 1792, made large collections of plant specimens in Tasmania and south-western Australia. Leschenault de la Tour, who accompanied Baudin on his voyage along the southern coast in 1800, collected many specimens in New South Wales and on the northern and western coasts of Tasmania. All these specimens are in the Paris Herbarium. More than 60 years later, George Bentham considered them to be so important, that, in a letter to Mueller in Melbourne, he cited the necessity to study them as one reason why it would not be practicable to prepare the *Flora Australiensis* in Australia.

Nineteenth Century

This century was one of great activity in descriptive sciences throughout the world and most of the world's great floras were prepared and published during this period.

For Australian botany, the first few years were particularly significant. Matthew Flinders made surveying voyages that mapped in great detail almost the whole of the southern and eastern coastlines and half the northern coastline of Australia, including Tasmania and the Gulf of Carpentaria, and he also completely circumnavigated the continent. His most important voyage, that in the *Investigator*, lasted from December 1801 until June 1803 and he probably visited more places on the Australian coast than any other single navigator before or since.

Fortunately for Australian botany, the *Investigator* expedition included Robert Brown, a young, energetic, knowledgeable botanist and an astute observer. During the voyage he collected and described thousands of plant specimens and added to them by assiduous collecting in New South Wales for about two years after the *Investigator* voyage terminated at Sydney in 1803.

In 1805 Brown took his specimens safely back to England and in 1810 produced the *Prodromus Flora Novae Hollandiae*, a systematically arranged collection of concise descriptions of plants from Australia. This work was intended to serve as a precursor to a more comprehensive and detailed flora of Australia. Brown's *Prodromus* saw the first really systematic account of plants from Australia. Unfortunately it was not well received by his contemporaries and he did not proceed with his plan to publish detailed descriptions of all the plants.

These descriptions, mostly made in the field or on the ship while the material was still reasonably fresh, were scribbled in Latin on used envelopes and other scraps of paper. They lay in the British Museum of Natural History unused, and unknown to most botanists for nearly 150 years. In 1955, Miss Nancy Burbridge, then Australian Botanical Liaison Officer at Kew, persuaded the British Museum authorities to allow them to be microfilmed. She also accomplished the mammoth task of sorting, arranging and indexing every sheet and scrap of paper. This index and the reels of microfilm are of enormous value to Australian botanists. There are copies in the Queensland Herbarium.

We have also several hundred of the specimens collected by Brown, mostly poorly labelled but recognizable by the handwriting. They are all traceable by reference to the microfilm and its index, Flinders' published accounts and maps of the *Investigator* voyage, Robert Brown's published journal and William Stearn's introduction to the facsimile edition of Brown's *Prodromus* published in 1960. Fortunately, all these items are in the library of the Queensland Herbarium.

During the 19th century, exploration and settlement of the new country proceeded rapidly. Reaching out first from Sydney and later from other settlements by ship, bullock wagon, horse dray, pack horse, saddle horse or on foot, explorers such as King, Oxley, Mitchell, Richard Cunningham, Allan Cunningham, Sturt, Eyre, Leichhardt, A. C. Gregory, McDouall Stuart, John Forrest, P. E. Warburton, Giles, Burke and Wills, Kennedy, Landsborough, Dalrymple and many others rapidly filled blank spaces on the map of Australia. Most of these expeditions either included or were led by men who collected plant specimens and realized their value in compiling an inventory of the plant resources of the continent. Between them, they added many thousands of specimens to the great European herbaria and later to the herbaria that were being established in the capital cities of the Australian colonies.

Close on the heels of the explorers came pioneer settlers, most of whom were farmers, graziers or miners. To Queensland, the early graziers were of particular significance. Government restrictions on free settlement in the vicinity of Moreton Bay caused most of these early pioneers either to travel overland inland from Sydney and take up land in the Darling Downs and West Moreton districts or to travel by ship north of Moreton Bay and settle in central and north Queensland. From about 1867 onwards, settlement north of Brisbane was stimulated by finds of gold over vast areas from Gympie in the south to the Palmer River and Croydon in the north.

During the first half of the 19th century, successive Colonial Botanists were appointed to New South Wales, with headquarters in Sydney. Their responsibilities ranged from growing vegetables for the Governor's kitchen to exploring remote parts of the colony in search of plants. Charles Fraser, Richard Cunningham, Allan Cunningham and Charles Moore made the greatest impact.

This period also marked the expansion of settlement in other parts of Australia—Hobart and other Tasmanian settlements in 1803 and 1805, Moreton Bay in 1824, King George Sound in 1827, Swan River in 1829, Port Phillip and Portland in 1834 and 1835 and Adelaide in 1836. Smaller settlements were also established at many other points around the coastline and small towns sprang up around Sydney.

In relationship to the history of the Queensland Herbarium, two points concerning this expansion and growth of European population are worthy of particular note, first the extraordinarily rapid growth of population in Melbourne and the Port Phillip District, second the very slow rate of growth at Moreton Bay and in other centres now included in Queensland. The Moreton Bay Settlement was given representation within New South Wales in 1857 and political recognition by the British Government as a colony independent of New South Wales in 1859. At the time of separation, the new colony of Queensland had a total European population of only 23 500, whereas by 1854 the Port Phillip District, which had become the independent colony of Victoria in 1851, had a population of more than 234 000.

The first general census of population in the Australian colonies was taken in 1881. The figures are given in Table 18, together with figures for comparable regions in 1901 (the first census taken after Federation) and 1972, the latest figures available at the time this paper was prepared. All figures are taken from the Commonwealth Yearbook for 1974.

CHANGING NEEDS AND DEMANDS FOR BOTANICAL KNOWLEDGE AND SERVICES

Changing needs and demands for botanic knowledge and services are closely linked with changes in total population and with the social structure within the community.

From the beginning of settlement until the early 1940's, Australia remained essentially a producer of foodstuffs, textile fibres and minerals. After an initial short period of dependence on imported foodstuffs, the country became self-sufficient in food production and soon produced substantial surpluses of wool, meat, grains and dairy products, most of which were exported to Europe. Minerals were almost all exported and the cash inflows that resulted helped to make possible rapid increases in population and expansion of primary production particularly in south-eastern Australia. Industrialization began in earnest during the years 1940 to 1946. This was chiefly concentrated in the eastern mainland capitals and other larger cities in the south-eastern quarter of the continent. This industrial expansion, combined with heavy overseas demands for wool and later beef, grain, coal, iron ore and

TABLE 18: Population of Australian Colonies, States and Territories

REGION	1881*	1901*	1972
New South Wales	750 000	1 355 000	4 662 000
Victoria	861 000	1 201 000	3 545 000
Queensland	213 500	498 000	1 869 000
South Australia	276 000	358 000	1 186 000
Western Australia	29 700	184 000	1 053 000
Tasmania	116 000	172 000	392 000
Northern Territory	33 400	4 800	93 000
Australian Capital Territory	. .	. .	158 000

*not including aborigines

other minerals as well as an active immigration programme, changed the face of Australia and the work habits of its people and imposed new and different pressures upon the native vegetation.

Until fairly recently, few people questioned the major objectives of society, that is, exploitation or development of natural resources for financial gain or increase in material prosperity. However, in the last few years, more and more people have become aware that these natural resources are not inexhaustible. There is also a growing awareness that man and his machines now have an infinitely greater capacity to change the landscape and that we have in fact reached a point where it is physically possible to produce rapid irreversible changes in the environment itself. In fact, in many cases the pendulum has swung too far the other way and the terms "conservation", "environment" and "ecology" have become "in" words. Unfortunately they are much misunderstood and misused by many well intentioned but ill-informed people.

The profound changes in community structure, patterns of production, living standards and social mores that have taken place in Australia in the last century have had a great effect on all herbaria in Australia. This is particularly so in Queensland which is now passing through a period of rapid developmental change and where so much of our material wealth which lies buried in the ground can only be extracted by destroying the native vegetation overlying it.

PEOPLE

Since we are dealing with the history of the Queensland Herbarium, let us look at the men who have been its directors. At the same time, we should consider the influence of other botanists, herbaria and naturalists in the development of the Queensland Herbarium.

It is rather remarkable that only six men directed Queensland's botanical services in the period of more than 120 years between 1855 and 1976 and four of those six occupied the office for a total of 115 years.

Walter Hill was appointed Superintendent of the Brisbane Botanic Gardens in 1855 by the Imperial Government. At that time the Moreton Bay settlement was part of New South Wales. Responsible government came to New South Wales in 1857 and Hill's appointment as Director of the Brisbane Botanic Gardens was confirmed by the Government of the Colony of New South Wales. The Colonial Botanist of New South Wales resided in Sydney and at that time was Charles Moore.

When the Colony of Queensland was separated from New South Wales by order of the British Parliament (much to the disgust of the New South Wales Legislative Assembly), Walter Hill was appointed by the new government as Colonial Botanist and Curator of the Botanic Gardens. He retained these positions until 1881 when he was retired at the age of 60.

During Hill's 26 years of office, the population of Queensland increased from about 23 000 to 213 000, nearly all of them farmers, graziers, miners or merchants. Quite appropriately, Walter Hill's major work was the introduction, cultivation and distribution of planting material of crop plants. Most of our major food crops were introduced during that period. Hill did spend some time in the collection and classification of native plants, the latter usually in collaboration with Ferdinand Mueller in Melbourne or Sir William Hooker at Kew. He was particularly interested in those native plants that seemed to have potential for economic or ornamental use.

Until 1975 I was under the impression that Hill did not keep herbarium specimens in Brisbane because there are very few of his specimens in the Queensland Herbarium. However, in the Annual Reports of the Colonial Botanist and Botanic Gardens for 1871, 1873, 1874 and 1875 he repeatedly drew attention to the fact that the bindings and some of the pages of books in the library had been completely destroyed by white ants (termites) and other insects and what had not been affected by the insects had been damaged by damp and wet penetrating the building. From the same causes almost the whole of his valuable collection of dried specimens, the labour of twenty years in the colony, and also the highly valuable collection brought with him from Kew, had been nearly completely destroyed. His final comment in 1875 was that until some arrangements were made to render the building suitable for the purpose for which it was built, it would be useless to make any addition to either the library or the plant collections.

Despite these difficulties, Hill's contributions to the Botanical Library were of enormous value. In the first budget of the Colony of Queensland in 1860, a sum of £100 was made available to the Colonial Botanist for the purchase of botanical books. Hill sent the whole sum to Sir William Hooker, then Director of the Royal Botanic Gardens, Kew. Hooker chose well and some of our most valuable and useful old books were bought with this money. Considering the conditions under which they were stored and used for so many years, most of them are in surprisingly good condition. The books were kept in the Director's residence until 1881 when they passed into the hands of F. Manson Bailey who removed them to safer quarters at the Queensland Museum in Queen Street.

Although Hill was unable to maintain an herbarium in the Brisbane Botanic Gardens, he sent many plant specimens to Melbourne and to Kew and they are still preserved in those herbaria.

On Hill's retirement in 1881, F. Manson Bailey* was appointed Colonial Botanist. Bailey was Acting Curator of the Queensland Museum, a position to which he had been appointed in 1880. He remained Acting Curator of the Museum until 1882, in addition to being Colonial Botanist. At that time the Queensland Museum and the Botanic Gardens were both in the Department of Lands. Walter Hill and F. M. Bailey were both responsible to the Surveyor General but Bailey was never Curator or Director of the Botanic Gardens.

So far as the Queensland Herbarium is concerned, F. M. Bailey virtually had to start from scratch. In his fascinating biography of the man, C. T. White (1950) gave details of his grandfather's early struggles to support a large family as a farmer, storekeeper and botanical collector. It was not until he reached the age of 48 that Bailey received his official appointment as a professional botanist. However, during the period between 1861 and 1875 he had built up a local reputation as a knowledgeable botanist and amassed a private collection of plant specimens. He used these specimens to form a nucleus for the Queensland Herbarium.

In 1875, the Government of Queensland appointed a Board to enquire into Causes of Diseases in Livestock and also the Plants of Queensland. F. M. Bailey was appointed botanist to this Board and served on it for about five years. Tangible results were two editions of an *Illustrated Monograph of the*

* In 1875 Bailey was entrusted to commence 'an Herbarium of the Flora of Queensland' under the supervision of Mr Commissioner Coxen, Trustee of the Museum (Report of the Acclimatisation Society of Queensland for 1874).—Ed.

Grasses of Queensland (1878), a *Descriptive List of Queensland Grasses* and several essays and catalogues to explain exhibits of grasses, woods and other native plants sent to different exhibitions and expositions in various parts of the world.

Although Bailey was trained in horticulture and although he remained very interested in cultivated plants, particularly ferns, he worked primarily on the identification and description of native and naturalized plants. His interest extended far beyond the flowering plants and ferns and included algae, fungi, lichens, mosses and liverworts. In the identification of "Cryptogams" he enlisted the help of the foremost overseas specialists of his day. His letter-books are still preserved in the archives of the Queensland Herbarium.

Bailey was fortunate that George Bentham had just published the final volume of *Flora Australiensis* so that he had a comprehensive work of reference on the native flora. He deliberately set out to extract from that work those parts relevant to the flora of Queensland and to include more up to date information that had been available to Bentham. The results were a *Synopsis of the Queensland Flora* in 1883, following in quick succession by three supplements and the publication between 1898 and 1902 of *The Queensland Flora* in six volumes. In this, he reprinted the general notes entitled *Outlines of Botany* from *Flora Australiensis,* he modified Bentham's keys to genera and species, omitting those not known to occur in Queensland and he mostly reproduced Bentham's descriptions of genera and species word for word.

Nevertheless, he did add such new material as had become available since the publication of the appropiate volumes of *Flora Australiensis* (including information from the *First* and *Second Census of Australian Plants* by Mueller), and added descriptions of weeds and other naturalized alien plants. In some families, notable Compositae and Chenopodiaceae, he adopted generic limits and nomenclature different from Bentham's and these were generally much nearer to those used today.

This leads us to consideration of the influence of Ferdinand Mueller and George Bentham on the development of knowledge of the Australian flora and on the growth of the Queensland Herbarium.

Ferdinand Mueller was born in Rostock, Germany, in 1825 and gained a degree in Pharmacy and the degree of Ph.D. from the University of Kiel at the age of 21. In 1848 he settled in Adelaide, but in 1852 moved to Victoria to try his luck amongst the rapidly growing mining populations. Fortunately, in that year Governor LaTrobe decided to appoint a Government Botanist for the new colony and, on the advice of Sir William Hooker, he offered the job to Mueller.

Mueller took office in January 1853 and remained as Government Botanist of Victoria until his death in October 1896, more than 43 years later. During those years, Mueller so dominated Australian botany that virtually all the worthwhile collections of plants outside of New South Wales went to Melbourne to augment the rapidly growing number of specimens being collected by Mueller in various parts of Australia.

Mueller was very well paid, he was a bachelor of rather frugal habits and he spent a considerable portion of his salary in paying collectors in various parts of the country. From our point of view the most important of these was John Dallachy who spent many years in north Queensland with Cardwell as his base.

Mueller himself was most active as an explorer and plant collector. He made exploring expeditions in South Australia and the north-west and north-east of Victoria, and in 1855 he was invited to join an expedition led by A. C. Gregory that travelled by ship from Moreton Bay to the mouth of the Victoria River in northern Australia, thence overland eastward and southward to the Suttor River and as far as Rockhampton. Mueller also spent a few days near Moreton Bay on the way back to Melbourne.

By the end of this trip in 1857, after having been in Australia for only nine years, Mueller claimed to know 9 000 species of Australian plants. He stated that during the North-west Expedition he had seen 2 000 species, of which 500 were new to science (Chisolm 1962).

Although Mueller sent thousands of plant specimens to other herbaria, he made sure that at least one sheet of each of his own collections and of those sent to him by other people were kept in Melbourne. The National Herbarium was established as an official institution in 1857, primarily to house the collections acquired by Mueller. Later he sent all his collections progressively to Kew for study by Bentham during the preparation of *Flora Australiensis* but most of the specimens were returned to Melbourne and are still there.

Mueller wanted to write a Flora of Australia but the Colonial Officer in London entered into a contract with George Bentham, an English botanist, to prepare this work. Although Mueller at first agreed to this proposal, when the time came to begin the work he raised many objections, chiefly that he had personal knowledge of the Australian flora whereas George Bentham had not. Sir William Hooker wrote to Mueller and told him bluntly that he considered that Mueller had neither the facilities nor the special kind of ability required for the task. Bentham already had written the *Flora of Hong Kong* and part of the *Flora Brasiliensis* as well as classical accounts of other large groups of plants. He was a man of independent means who was able to devote his whole time to the task.

In 1861 Bentham accepted a Commission from the Colonial office to prepare a *Flora Australiensis*. The first volume was published two years later, in 1863. He had planned to take eight years for the whole work. In fact, it took him fifteen years and he was 78 years old before the last part was published. Moreover, when that was completed he went on to write other standard botanical texts.

Bentham was a man with tremendous ability, self-confidence and courage and had a very well organized mind, combined with disciplined habits of work. In a letter to Mueller he wrote:

> "As to the limits of genera and species, the longer I live (and I have now looked at them for eight and thirty years) the more I see how little fixity there is in them and how impossible it is that botanists' views should agree upon them. In writing a systematic work one must make up one's mind on the spot, often upon insufficient materials and often must take into consideration the opinions of others against one's own. I say this because it is inevitable that on many occasions I may unite or separate species in a manner you may not approve, just as in other works I have published, botanists whose opinions I value more than my own disagree with the conclusion I have come to. Therefore it is that I have always declined joint work unless, as in the case of Dr. Hooker, I can daily and constantly discuss with him. I am anxious to give every credit to those who kindly assist me and in the Australian Flora I am particularly desirous that you should be satisfied with what I say on the subject but I

> expressly wish to have the sole responsibility, so that neither you nor anyone else shall be committed by what I do."

Bentham refused to treat *Flora Australiensis* as a joint work and he said that the work had to be entirely his own. He gave Mueller acknowledgement on the title page. Despite these unequivocal statements by Bentham we still find some botanists and bibliographers citing the authorship of *Flora Australiensis* as "Bentham and Mueller", which it is not.

We in Australia do not realize how fortunate we are to have *Flora Australiensis.* It was the first and is still the only flora of an entire continent. Bentham's idea was that he should account for all the material in the older herbaria of Europe and all the older literature not available in the colonies so that Australian botanists would have a foundation upon which to build as the flora became better known by further exploration and collecting.

Bentham suggested to Mueller that he should abandon production of his *Fragmenta Phytographiae Australiae* and other miscellaneous papers and should concentrate on producing a supplement to *Flora Australiensis* in a format similar to the original. Mueller did not take up his suggestion but continued to publish in various journals, many of them quite obscure and not widely circulated.

In March 1893, F. M. Bailey issued a circular to Australasian scientific workers and societies pointing out the pressing need for a supplement to the *Flora Australiensis,* laying stress on the fact that it must follow on Bentham's lines of classification and be written in the same style and format. He asked for the co-operation of all Australian botanists in undertaking this project (Shirley 1893).

Mueller's reaction was characteristic. In the *Victorian Naturalist* for April 1893 is an unsigned note (probably by Mueller) indicating that "the publication of a completing volume to Bentham's *Flora Australiensis* is likely to be shortly undertaken in Melbourne". It went on to point out that "it has long been the intention of Baron von Mueller to furnish such a volume" but no reference was made to Bailey's proposal.

Neither Bailey nor Mueller ever produced the promised "supplement" or "completing volume" to Bentham's *Flora Australiensis.* In the *Queensland Flora* Bailey included additional information of the kind envisaged for such a supplement but this information related only to plants in Queensland.

The *Flora Australiensis* is the foundation of the Queensland Herbarium. The Brisbane collections were originally arranged in Bentham's sequence and the ready reference set in the present building is still arranged in that sequence which corresponds with the one used in *The Queensland Flora.*

F. M. Bailey continued to work as "Colonial Botanist". In 1902, when he reached the age of 75 years, he was retired and the position of Government Botanist abolished. Bailey refused to accept retirement and said he would continue to work whether they paid him or not. There was a great outcry in the daily and weekly press and the Government of the day, bowing to public pressure, re-instated Bailey but at half salary (£150 per year), a sum that was never increased. In 1915, he died at the age of 88.

His son John Frederick Bailey was appointed Government Botanist but he occupied the postion for only about 18 months before moving to Adelaide to take charge of the Botanic Gardens in that city. J. F. Bailey had worked in the Herbarium as assistant to his father for several years before he was appointed

Curator of the Brisbane Botanic Gardens in 1905. He had the distinction of being the last man to hold both positions, Government Botanist and Curator of the Botanic Gardens.

The next Government Botanist was Cyril Tenison White, a man to whom natural history in general and botany in particular owes so much. C. T. White was a grandson of F. M. Bailey and was appointed as Pupil Assistant to his grandfather in 1905 at the age of 15. He published his first botanical paper at the age of 18 and had five more papers published before he was 21. In less than seven years he had made the 970 line drawings of plants that illustrate the *Comprehensive Catalogue of Queensland Plants,* published in December 1912.

This early task gave him an acquaintance with a wide variety of native plants and no doubt laid the foundation for his extraordinary facility for identifying plants at sight. He was one of nature's gentlemen—friendly, tolerant, helpful and singularly modest about his own abilities and achievements. He had a keen eye, a very retentive memory and an extraordinary capacity for hard work.

When J. F. Bailey went to Adelaide, White was appointed Acting Government Botanist at the age of 27. The idea that a youngster of 27 could cope fully with the work of a veteran of 88 seemed ridiculous to the authorities. There was a public outcry about the injustice of the Acting appointment and he was soon appointed Government Botanist. He filled the position with distinction for 33 years until August 1950 when he died suddenly at home at the age of 60, still at the height of his intellectual powers.

C. T. White contributed a tremendous amount to the herbarium and to Queensland botany generally. He collected very widely in Australia, often during his vacation periods. He also collected in New Guinea, New Caledonia and the Solomon Islands. In addition he stimulated the interest of many people in botany and sponsored collections by paid collectors, mainly S. F. Kajewski and L. J. Brass, in Queensland, New Hebrides, Solomon Islands, Bougainville and New Guinea. For this purpose he managed a small fund made available by the Arnold Arboretum of Harvard University. His influence on Queensland botany did not end there. He gave help and encouragement to all who asked for it and he was a stimulating influence on the younger generation of botanists, of whom Stan Blake, Lindsay Smith and myself were examples.

His direct influence on the Queensland Herbarium was particularly significant. Until his time, most Australian herbaria were regarded by botanists such as F. M. Bailey and Ferdinand von Mueller almost as personal property. These men mainly worked alone and were not unduly concerned with completeness of labels or mounting of specimens. They knew almost every individual specimen by sight, who had collected it and often where and when he got it. As a result many of the older specimens have only scraps of paper for labels with cryptic initials, numbers, symbols or abbreviations that are not now readily interpretable.

Some plants, such as fleshy orchids or ferns transplated from the field, were described from living material and no dried specimens were prepared and stored in the Herbarium as type specimens for the names concerned.

There appeared to be an implicit faith that fresh material would always be available in the field, if you knew where to look. None of these earlier botanists could foresee the awful potential of the bulldozer or the real estate developer or anticipate the destructive effects of accelerating social pressures on native plant communities. In fact, there is little evidence to suggest that

they were conservation-minded at all. For example, F. M. Bailey's report after a visit to the 18-Mile Swamp on Stradbroke Island in 1880 stated that it seemed to be an excellent site for the establishment of a rice-growing industry. No doubt the forests and the grasslands seemed so vast and the population so small that it was inconceivable that they could be destroyed except in localized areas devoted to cultivated crops, urban development or extractive industries such as quarrying.

C. T. White was very interested in economic botany, particularly native grasses and other fodder plants, poisonous plants and weeds. From the taxonomic point of view his chief interest was in woody plants and most of his revisionary work was done on woody families. This is probably due to a number of factors, firstly the extensive collections of woody plants made on behalf of the Arnold Arboretum, secondly his close association with W. D. Francis who had an unsurpassed field knowledge of the rainforest trees of eastern Australia. He was conscious of the need to record the presence of exotic plants, particularly new weeds, as soon as they became estabished. He taught a course in Forest Botany at the University of Queensland and wrote an appropriate text-book.

During his term of office, the number of specimens in the Queensland Herbarium increased enormously. These included not only Australian material but also material from all over the world, sent on exchange with other herbaria. In this way, he assembled large and important collections of plants from New Guinea, Solomon Islands, New Hebrides and New Caledonia and acquired many duplicates from the Bureau of Sciences in Manila.

By about 1930, he had begun to realize that the Queensland Herbarium was fast becoming a collection of scraps. He set out to mount the specimens and to make sure that all future specimens were adequately labelled. The task of mounting the older specimens is still incomplete, 46 years later. He was one of the first of the Queensland botanists to include adequate provenance data on herbarium labels. It is safe to say that the modernization of the Queensland Herbarium began with C. T. White.

When White died suddenly in 1950, he was succeeded by William Douglas Francis who had been his assistant for 31 years. Francis retired in 1954 at the age of 65, after serving for four years as Government Botanist. Like C. T. White, W. D. Francis was a self-taught man. He had two main interests, the classification, identification, distribution and ecology of rainforest trees and the fine structure and chemical composition of protoplasm.

The first interest occupied most of his official time, interspersed occasionally with perceptive field studies of difficult poisonous plants problems. The second interest was pursued entirely in his own time and at his own expense. He bought the most sophisticated microscope then available and by reading and diligent practice made himself a first-class microscopist and micro-chemist. He produced several papers of great originality. The earlier ones were fairly conventional descriptions of anatomical structures of wood and bark of several species, the buttresses of rain-forest trees and even the structure of the Queensland Nut *(Macadamia)* of which he cut thin sections after soaking the hard-shelled seeds in hydrofluoric acid for six months to soften them.

Later he turned to the iron bacteria and described their fine structure and their behaviour in culture solutions. This in turn led him to speculate on the role of iron in the origin of life and to study precipitated oxides of pure iron.

In a purely inorganic culture solution in which was suspended pure iron wire he recognized microscopical bodies that gave all the standard microchemical tests for protein.

One of the last papers in this series drew attention to the spiral nature of protoplasm and postulated that the ultimate structure was probably in the form of linked, double helical spirals. It is a pity that Francis did not live long enough to read the works of Crick, Watson and others who elucidated the double helical arrangement of atoms in the molucules of DNA. In conversation, it was quite obvious that Francis had a mental picture of the ultimate molecular structure of protoplasm as being in this form but that he realized that the methods and instruments available to him were incapable of resolving these very fine structures with any degree of certainty.

W. D. Francis was appointed to the staff of the Queensland Herbarium in 1919 as Assistant Government Botanist. He was a farmer who had served in France with the first A.I.F. and on his return to Australia about 1918 he joined his father and brothers in the clearing and development of one of the blocks of virgin rainforest in the Kin Kin area south-east of Gympie that were then being converted to dairy farms. Whilst engaged in cutting down the rainforest, Francis became interested in the identity of the trees he was helping to destroy. He was also in an excellent position to collect good herbarium material from the fallen trees.

He was also a painstaking photographer and a patient, accurate observer who photographed in the field and described in detail most of the species in the rainforests of the region, not only the leaves, flowers and fruits, but also the habit, structure and bark of the trees as they occurred in the field. Based on his extensive experience in the field and the herbarium, Francis wrote two editions of *Australian Rainforest Trees,* the authoritative work on this subject and a milestone in the extension of botanical knowledge to the community at large.

Despite his originality of mind, as Government Botanist, Francis was not an innovator. In his official role he was content to do what came to hand and to preserve the *status quo.*

During 1930 and early 1931, through representations from C. T. White in Brisbane and Sir Arthur Hill, Director of the Royal Botanic Gardens, Kew, it was arranged that W. D. Francis should spend a year at Kew and that in exchange C. E. Hubbard of the Kew staff should spend a year in Brisbane. This exchange was of immense value to the Queensland Herbarium in particular and Australian botany in general. Charles Hubbard was an energetic young man and the rising grass taxonomist who had inherited the mantle of Stapf. His capacity for work was prodigious. In twelve months he examined every grass specimen in the Queensland Herbarium, re-determined and annotated almost every one of them, prepared and labelled by hand new folders for each species and re-arranged the Australian grasses in conformity with a new classification of the family then taking shape. Moreover, he made several extensive collecting tours and many shorter ones within the State and collected more than 15 000 specimens personally during his short stay in Australia.

Hubbard had the effect of stimulating Blake's interest in Cyperaceae and Gramineae and my own interest in grasses. He also revolutionized the attitude to grasses of botanists in other Australian herbaria. This was the beginning of a new era for botany in general and grass taxonomy in particular in Queensland and other States. His influence cannot be over-rated.

When W. D. Francis retired on 30th June, 1954, I was appointed Government Botanist and retained that position until my voluntary retirement on 2nd July, 1976, a period of 22 years. The title of the position was changed to Director of the Botany Branch in July, 1971.

My own background was entirely non-botanical. I was sent to the Herbarium in April 1930 as a clerk. Contact with White and Hubbard and the encouragement of the Under-Secretary, Mr R. Wilson, caused me to abandon a clerical career, to matriculate and complete a Science degree as an evening student at the University of Queensland. During all those years, except the final year, I worked full-time in the Herbarium as clerk and typist, later as Assistant-to-Botanist.

My later inclination towards economic botany probably stemmed from the influence of C. T. White and the fact that in 1934 I was given the task of collating reports on Mitchell grass from inspectors throughout western Queensland and for identifying the many hundreds of specimens of grasses and other native fodder plants that accompanied those reports. Following prolonged drought, there was concern that the Mitchell grass pastures of western Queensland may have suffered irreparable damage and in January 1937 I was sent to study the problem with headquarters at Blackall. I remained there for five years until 1942 when I enlisted in the R.A.A.F. and served for four years as a Meteorological Officer, the last two of them in Charleville.

Returning to the Herbarium in early 1946, I spent many years on field studies of poisonous plant problems such as Georgina River Disease, Birdsville Disease and St. George Disease, edible trees and shrubs, particularly mulga, and later brigalow and its control, weed surveys and weed control. I also dabbled in the field of climatology in association with the late Dr George Moule and various members of his staff. Poisonous plants remained throughout and still are among my chief interests.

After my appointment as Government Botanist in 1954, I made a conscious effort to modernize the Queensland Herbarium and to meet new demands being received for botanical information. After about 1970, I tried to develop a system for computer storage and retrieval of the wealth of original data that had lain buried for more than a century on the labels of specimens within the herbarium (Everist 1973). I leave it to future Directors to judge whether or not the ground work I have laid is sound.

Inevitably, in order to meet increasing demands for information and services and to update the herbarium, it became necessary to increase and diversify staff and to develop an organizational framework to ensure that responsibilities were shared and that tasks were assigned to those best fitted to do them. Some people might see this increase as an example of the operation of Parkinson's Law, but I can assure you that new appointments were made only to meet real needs and never to find jobs for people. For more than 15 years, demands for botanical services have been steadily increasing and becoming more complex. The standard of preparation, labelling and maintenance of herbarium specimens also had to be improved.

Two other factors contributed to the necessity to increase staff. Firstly we were pitchforked into accepting responsibility for brigalow control and weed control generally, as well as continuing our traditional role of identification. Secondly, we deliberately decided to look more closely at vegetation patterns and floristic associations instead of merely gathering facts by haphazard collection of botanical specimens. To accomplish these tasks we had to have

trained staff and improve facilities. My greatest disappointment is that we were not able to achieve one of the major objectives, the production of a flora or regional floras for Queensland. However, progress in this direction is being made and I hope these floras will materialize in the not too distant future.

The present Director, Dr Robert William Johnson, took over in July, 1976. I am confident we can look forward to a long period of botanical progress in Queensland.

BUILDINGS AND FACILITIES

Apart from Walter Hill's herbarium which was destroyed by damp and white ants, the collections of the Queensland herbarium have been housed in four different places.

From 1879 to 1889, they were in the basement of the Queensland Museum, then situated in Queen Street. In 1889 they were moved to a new building erected in William Street for the Department of Agriculture. The Museum of Economic Botany and the Herbarium occupied about four-fifths of the original space in that building. This was in accordance with the needs of the time. A primary responsibility of the Colonial Botanist was to maintain an up-to-date inventory of the plants in the State. Plant introductions were handled by Botanic Gardens, also under the control of the Department of Agriculture and closely associated with the Colonial botanist.

In 1888, the total population of Queensland was 336 940, about half the present population of the City of Brisbane. It was possible to meet the needs of this population with a very small public service, firstly because communication was slow and difficult and by the time a farmer received an answer, his problem has usually solved itself one way or another and secondly because people lived in an unsophisticated society where they are accustomed to making their own decisions and enduring hardships if things went wrong.

In 1912, a new building was constructed for the Botanic Museum and Herbarium. This was situated within the fenced boundary of the Botanic Gardens but on a piece of land specially reserved for the purpose and not part of the Reserve for Botanic Gardens. The building was made of wood and the floor space was almost exactly the same as that occupied in William Street. Obviously there was no room for expansion or even for the extra space normally needed to accommodate growing collections of plant specimens and books in herbaria and museums. Also housed in this building was the Government Entomologist and Plant Pathologist, Mr Henry Tryon. A great amount of space was occupied by the Museum of Economic Botany, with glass-topped display cases of plant parts and plant products, crowned with displays of photographs, paintings and wood samples. Some of you may remember them.

The herbarium specimens were at first all stored in bundles in cabinets originally made for F. M. Bailey. Later, as the collections grew, sets of open pigeonholes were erected progressively and the specimens stored in cardboard boxes. Eventually, these pigeon-holes towered to a height of 12 feet above ground. You did not have to be a mountaineer to work in the herbarium, but it certainly was a great help.

In 1946 two work-rooms were cut off from the eastern end of the Museum room and the museum collections were crowded into the remaining space. Later, most of the museum material had to be transferred to steel drawers, and the space-wasting display cases removed from the building altogether. Both

front verandahs were enclosed with glass and wooden louvers and used as workrooms.

In 1959, after several years of agitation and a resolution from A.N.Z.A.A.S. drawing attention to the vulnerability of the collections and library, a fireproof brick annexe was built at the rear of the wooden building. This was sufficient to house most of the library, and the wooden shed in the backyard that was tied to the new annexe was used for temporary storage. These improvements relieved the situation slightly for a time. However, buildings and facilities were quite inadequate to store the increasing number of specimens and provide working space for the growing staff and the main herbarium collections remained extremely vulnerable to fire.

The last real improvement came in 1968, when the present Botany Building in the Indooroopilly Complex of the Department of Primary Industries was completed. For the first time since 1912, there was enough room for all the staff, the herbarium specimens and the library. Again, no room was provided for expansion, but we were able to re-arrange the Herbarium collection, systematize the arrangement of the library and re-organize the flow of work to make better use of staff.

Fortunately, these improvements came just in time to provide facilities to meet greatly accelerated demands for vegetation maps, land use studies, environmental impact statements and floristic information that stemmed from recent requirements for the assessment of possible ecological consequences of developmental proposals.

I am sorry to say that, unless further facilities are provided very soon, the squeeze will again restrict the potential output of a hard-working, well-trained, competent, experienced and enthusiastic staff of experts in these fields.

CONCLUSION

I did my best to bring the Queensland Herbarium up to 20th century standards, to make it more useful to other scientists and the public and to lay a firm foundation for further development. I am sure that Bob Johnson and his staff have the capacity to carry it successfully into the 21st century. I only hope that he will be given the support, finance and the facilities to do so.

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